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Supporting Information

Reactivity and Controlled Redox Reactions of Salt-like Intermetallic Compounds in Imidazolium-Based Ionic Liquids

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^{19}F NMR investigation of [DBMIM][TFSI]

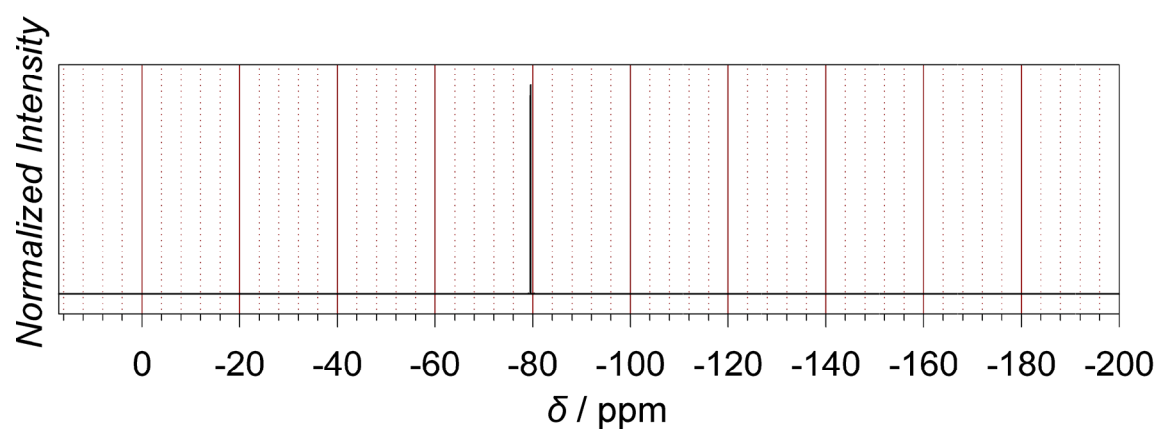


Fig. S1. ^{19}F NMR spectrum of [DBMIM][TFSI] in CDCl_3 solution.

TG-MS investigation of [DBMIM][TFSI]

The signals observed at below 250 °C were evaluated as follows: The expected molar ratio of the Ar isotopes is exactly reflected in the relative ion currents of the Ar^+ signals at $m/z=40$; 38; 36 and agrees also with the Ar^{2+} signals at $m/z=20$ and 19 for ^{40}Ar and ^{38}Ar . Due to the low ionization probability combined with the low abundance of ^{36}Ar and ^{38}Ar , the Ar^{3+} signal was observed only for ^{40}Ar ($m/z=13.33$). For $m/z=18$ the ion current was detected slightly above the value expected for the relative ionization probability for $^{36}\text{Ar}^{2+}$: While the ion current ratio for $I(\text{Ar}^+):I(\text{Ar}^{2+})$ should be about 11.5:1 as deduced from the respective constant ratio for the ^{40}Ar and ^{38}Ar observed for the signal pairs at $m/z=40$ and 20, and $m/z=38$ and 19, the current ratio $I(m/z=36):I(m/z=18) \approx 9$ was perceptibly smaller (Fig. S2). This result indicates an additional contribution to the ion current at $m/z=18$, which should trace back to the presence of water in the gas phase. The weaker fragment signals of water ($m/z=17$ and 16) were detected in parallel as well, with reasonably lower ion current. However, because these two signals were increasingly close to the detection limit, their ion current values evidently suffer from the background noise and their detection in the reference ratio [1] may not be expected anymore. Despite of the contribution of water to $m/z=18$, the ion current ratio $I(m/z=36):I(m/z=18)$ was practically independent of temperature below 300 °C. The detected water should thus originate from the low residual moisture of the purging gas rather than being released in significant amount from the [DBMIM][TFSI] specimen. Constant and low ion currents were observed for other impurity signals as well, which are assigned to low concentrations of CO_2 and N_2 in the purging gas.

[1] NIST Mass Spectrometry Data Center (William E. Wallace, director), *NIST Chemistry WebBook, NIST Standard Reference Database Number 69* (Eds.: P.J. Linstrom, W.G. Mallard), National Institute of Standards and Technology, Gaithersburg MD, 2010.

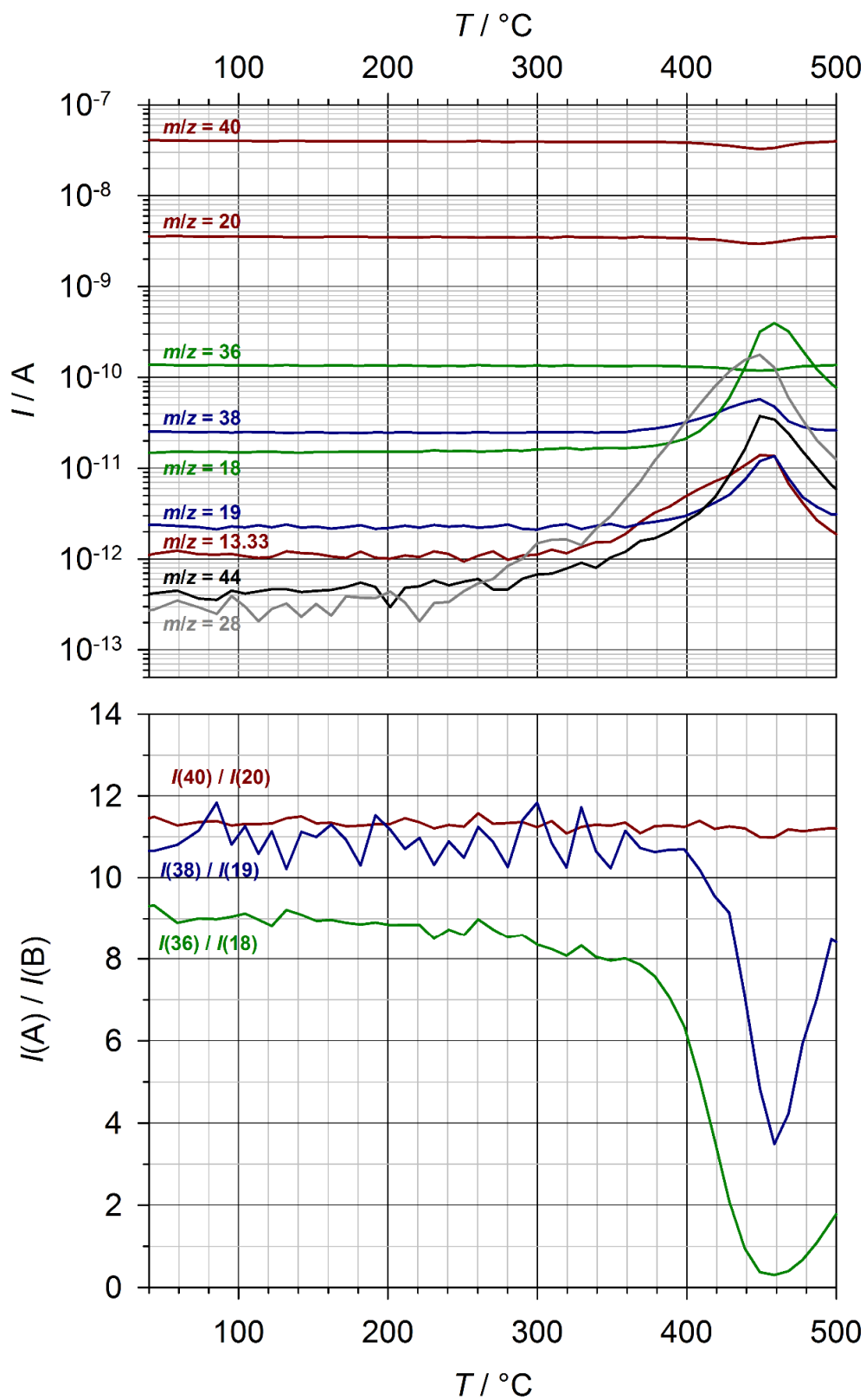


Fig. S2. Temperature-dependent mass spectroscopy of [DBMIM][TFSI] within the TG-MS experiment discussed in the main text: Ion current detected for the given m/z (top diagram) and ratio of the ion currents for selected pairs of m/z observation channels (bottom diagram) vs. sample temperature.